

REMARKS

Allowable Subject Matter

In the June 16, 2005 Office Action, claims 26 to 36 were found allowable.

Rejection of Claims on Reference Grounds, and Traversal Thereof

In the June 16, 2005 Office Action:

claims 1-3, 5-12-14, 16-18, 20-21 and 37-39 were rejected under 35 U.S.C. §102(b) as being anticipated by DiMeo, et al., U.S. Patent No. 6,265,222 (hereinafter DiMeo); or Gruber, U.S. Patent No. 3,676,293 (hereinafter Gruber); or Bernstein, U. S. Patent No. 5,752,410 (hereinafter Bernstein);

claims 15 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over DiMeo in view of Gruber; and

claims 22-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over DiMeo in view of in view of Huang, et al., U.S. Patent No. 6,553,335 (hereinafter Huang).

These rejections are traversed in application to the claims as amended herein. The patentable distinctions of the amended claims over the cited references are set out in the ensuing discussion.

Rejections under 35 U.S.C. §102(b)

1. Claims 1-3, 5-10, 12-14, 16-18 and 20-21 were rejected under 35 U.S.C. §102(b) as being anticipated by DiMeo. Applicants assert that the cited reference is not anticipatory of the presently claimed invention.

Anticipation under 35 U.S.C. § 102 requires the presence, in a single reference, of each and every element of the claimed invention, arranged as in the claim. *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 485 (Fed. Cir. 1984). The sensor system described by DiMeo fails to meet this standard.

Initially, it should be recognized that the presently claimed invention recites a gas sensing system as recited in claim 1, and recreated below.

1. A gas sensor assembly for sensing halogen species comprising:

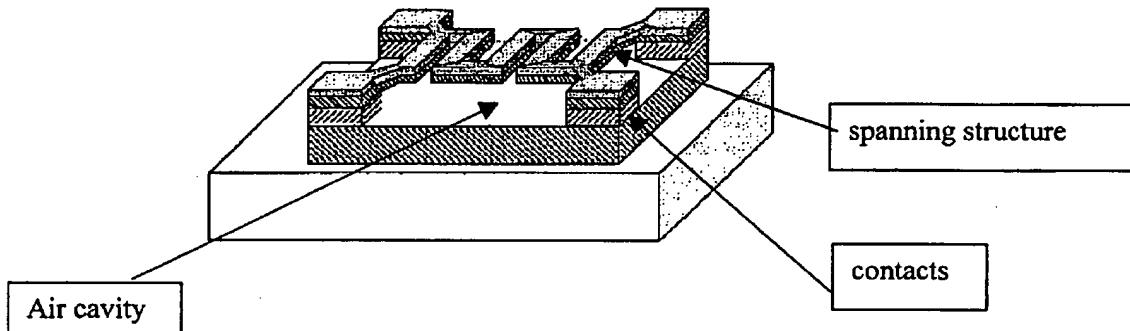
a substrate having a substrate surface; and

at least one gas sensor, wherein the gas sensor comprises:

a free-standing support structure, wherein the free standing support structure comprises at least two spaced apart contacts that project above the substrate surface into an air gap and a lateral surface that spans between the contacts with an air cavity therebeneath, wherein the free-standing support structure is fabricated of a support material that is resistant to the halogen species; and

a metal gas sensor element positioned on at least the lateral surface of the free-standing support structure, wherein said metal sensor element comprises a metal or metal alloy exhibiting a detectable change upon contact with a halogen species.

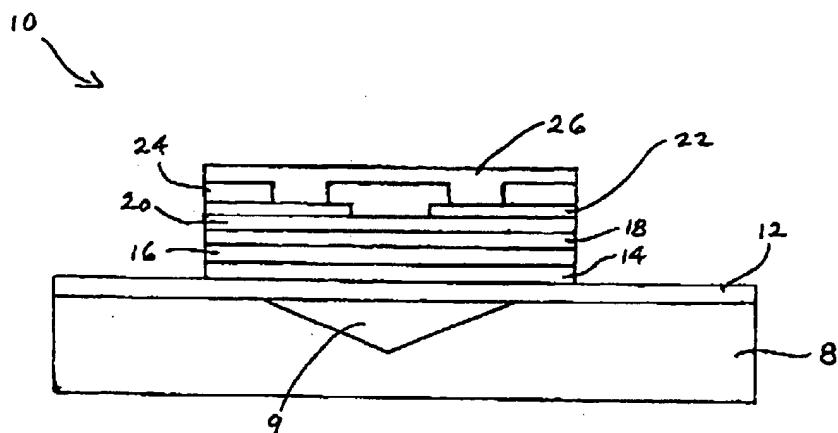
The structure described in claim 1 is as shown below in Figure 11, recreated for ease of discussion:



It is evident that the free-standing support structure includes spaced apart contacts that rise vertically above the substrate with a lateral surface that spans between the contacts. Further, the vertically rising contacts rise through an air cavity that is also under the lateral span. The metal gas sensor element is positioned on the lateral surface.

In contrast, DiMeo describes a hydrogen sensing device using a rare earth metal as a sensing element. The DiMeo sensing system includes using a rare earth metallic layer as the sensing layer that upon contact with hydrogen forms a hydride, which is a permanent conversion as stated in column 16, line 65. This dihydride can be further converted to a semiconducting trihydride upon contact with additional hydrogen.

Figure 3 of DiMeo, recreated below, shows the placement of the many different layers of the hydrogen sensor.



Specifically Figure 3 shows the hydrogen sensor 10 that is constructed on a silicon substrate 8. The silicon dioxide layer 12 is then overlaid in sequence by polycrystalline silicon heating element 14, insulating layer 16, conductive layer 18, insulating layer 20, contact pads 22, insulating layer 24. The sensor layer 26 is finally deposited on top of the layer 24. Part of the silicon substrate is removed from pit 9.

Clearly, the sensor of DiMeo is entirely different from applicants' claimed invention. For example, there are no vertical projecting contacts that rise above the surface of the substrate into an air gap and no lateral support that span between these contacts to provide a surface for the metal gas sensor coating with an air cavity therebeneath. Additionally, there is no disclosure or description in DiMeo that provides for an air cavity beneath this lateral support. Instead, the sensor of DiMeo is a sandwich of different layers similar to a building with multiple floors, which is very different from the bridge type structure of applicants.

Further, the hydrogen sensing element of DiMeo is fabricated from a rare-earth metal that reacts with hydrogen. This sensing element is entirely different from that of the recited fluoro sensing element of the present invention. Still Further, the sensing element is optionally covered with a barrier material and even though the Office proposes that this barrier layer can pass as a sensing layer, as stated by the Office, it cannot and does not pass as a sensing layer because this barrier layer is only optional and thus if not included then there would be no sensing layer. Clearly, when an element is optional then ambiguity is an issue and any ambiguous reference cannot be anticipatory.

Thus, the DiMeo reference does not teach or suggest each and every element of applicants' claimed invention, as arranged in the presently claimed invention. Applicants request the withdrawal of the rejection of claims 1-3, 5-10, 12-14, 16-18 and 20-21 under 35 U.S.C. §102(b).

Claim 11 was rejected under 35 U.S.C. §102(b) as being anticipated by Gruber. Applicants insist that the cited reference is not anticipatory of the presently claimed invention.

Claim 11, as now amended, recites the following:

A gas sensor assembly comprising:

a substrate; and
a free-standing silicon carbide support structure spanning an air cavity comprising:

at least one protruding support rising above the substrate and a lateral structure contacting the protruding support, wherein the lateral surface is coated with a layer of nickel or nickel alloy.

In contrast, Gruber describes a fibrous crystalline silicon carbide material that forms a mat or felt like material. This felt like material can be admixed with a metal such as nickel. However, the presently claimed structure is not disclosed or described in Gruber. Thus, Gruber does not anticipate claim 11 and applicants request the withdrawal of such rejection under 35 U.S.C. §102(b).

3. Claims 37-39 are rejected under 35 U.S.C. §102(b) as being anticipated by Bernstein. Applicants submit that Bernstein is not anticipatory of applicants' claimed invention.

Bernstein describes a tunneling sensor and by viewing the figures of Bernstein it is evident that there is no description of a silicon carbide support structure positioned on the substrate, wherein the support

structure comprises at least one protrusion rising above the substrate and a lateral surface supported by the protrusion which extends beyond the protrusion and forming an air gap between the substrate and the lateral surface of the support structure; and a gas sensing metal layer thereon, wherein the suspended silicon carbide support structure is fabricated by using multiple sacrificial molding layers that are subsequently removed to release said support structure. Thus, this cited reference does not meet the standard required to defeat the novelty of claims 37-38. Accordingly, applicants request the withdrawal of this rejection under 35 U.S.C. §102(b).

Rejection under 35 U.S.C. §103(a)

1. Claims 15 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over DiMeo in view of Gruber. Applicants respectfully traverse this rejection and submit that DiMeo alone or in combination with Gruber does not render Applicants' claimed invention *prima facie* obvious.

Claims 15 and 19 depend from independent claim 12, thus the combination of cited reference must teach or suggest each and every element of applicants' claim 12, as recited below:

12. A gas sensor assembly comprising:

a substrate; and

a free-standing gas sensing element positioned on the substrate and arranged for contact with a gaseous environment susceptible to the presence or change of concentration of one or more target gas species therein, wherein said free-standing gas sensing element comprises:

a suspended support structure comprising at least one protrusion rising above the substrate and a lateral surface contacting the protrusion and extending beyond the protrusion to form an air gap thereunder and wherein at least the lateral surface is coated with a layer of a gas sensing material, and wherein said gas sensing material in exposure to the target gas species exhibits a response indicative of the presence or change of concentration of the target gas species in said gaseous environment.

Thus, the gas sensing device comprises

- 1) a substrate;

- 2) a suspended support structure positioned on the substrate and having at least one protrusion that supports a lateral surface, wherein the lateral surface extends beyond the protrusion;
- 3) an air gap under the lateral surface; and
- 4) a coating of gas sensing material coated on the lateral surface.

As stated numerous times above, DiMeo does not teach or suggest each and every element of the presently claimed invention and the inclusion of the teachings of Gruber does not overcome the shortcoming of DiMeo.

Applicants submit that the Office is merely picking and choosing elements from unrelated references in an attempt to recreate applicants' claimed invention. However, the Office would not be able to search the prior art and look for isolated terms without the blueprint of applicants' claimed invention. Clearly, using the present invention as a blueprint in the searching process is impermissible hindsight.

In light of the above discussion and the fact that the proposed combination does not teach or suggest each and every recited element of applicants' claimed invention, applicants submit that the Office has not met its burden of establishing a *prima facie* case of obviousness. Accordingly, applicants respectfully request that the rejection of claims 37-38, on the basis of obviousness, be withdrawn.

2. Claims 22-25 were rejected under 35 U.S.C. §103(a) as being unpatentable over DiMeo in view of Huang. Applicants respectfully traverse this rejection and submit that DiMeo alone or in combination with Huang does not render Applicants' claimed invention *prima facie* obvious.

According to the Office:

"it would have been obvious to one having ordinary skill in the art at the time of the invention to utilize in DiMeo the fluoro species of Huang because while NF₃ cleaning gas continuously flows into the process chamber interior, the NF₃ is also consumed simultaneously, resulting in a constant radiation brightness being detected thereby making the above combination more efficient."

Initially it should be noted that claim 22 depends from claim 12 and as such, the gas sensing comprises

- 1) a substrate;

- 2) a suspended support structure positioned on the substrate and having at least one protrusion that supports a lateral surface, wherein the lateral surface extends beyond the protrusion;
- 3) an air gap under the lateral surface; and
- 4) a coating of gas sensing material coated on the lateral surface.

Thus, unless the proposed combination teaches each and every one of the above recited elements the combination does not meet the standards required to render the presently claimed invention obvious. As stated above DiMeo teaches the use of a sensing layer comprised of a rare earth metal that reacts with hydrogen to form a dihydride and trihydride. Importantly this sensing layer is not positioned on a lateral surface that is supported by protrusions extending above a substrate surface. Further there is no air gap positioned and in contact with the lateral surface and protrusions.

Huang teaches the use of a quartz transducer for placement in a semiconductor processing chamber. The quartz transducer, notably fabricated of silicon dioxide, is placed within the chamber to determine the completion of an etching process of the chamber's interior. Thus, neither of the cited references alone or in combination teaches or suggests each and every element of the claimed invention.

In order to overcome the shortcomings of DiMeo, the Office has attempted to combine the teachings of Huang with DiMeo. However, if the teachings of Huang are introduced into the device of DiMeo it will no longer function as intended, which is a clear indication that the combination does not defeat the patentability of the present invention.

It is incumbent on the Office to view applicants' claimed invention as a whole. *In re Wesslau*, 174 U.S.P.Q. 393 (CCPA 1965). As such, certain individual features from the cited references may not be arbitrarily chosen (while equally arbitrarily discarding other disclosed features) to merely lump together disparate features of different references as a mosaic in an attempt to meet the features of the rejected claims. Thus, the Office is not allowed to pick and choose just certain parts of different references and combine them, but instead, the references in their entirety must be considered. As such, the teachings of Huang and DiMeo must be viewed in their entirety and the Office must recognize that the DiMeo system must include a sensing material that reacts with hydrogen while Huang uses a transducer for measuring the levels of fluoro compounds. As discussed above DiMeo

specifically uses a rare earth metallic material that is reversibly converted from a dihydride to a trihydride upon contact with hydrogen.

Applicants submit that if the systems of the two references are combined, although there is no teaching or suggestion of such a combination, DiMeo would no longer function as intended because the rare-earth reversible hydrogen-sensing layer cannot be replaced with the quartz transducer of Huang. Clearly, the SiO₂ transducer would not react with the hydrogen gas so there would be no signal for monitoring. Hydrogen gas can be flowed through a glass tube made of quartz and there is no noticeable difference in the crystal structure for use as a monitoring indicator.

Clearly, combining the references would change the method of operation of the DiMeo sensing system. Notwithstanding the adverse outcome by the combination of cited references, the Office contends that this is exactly what one skilled in the art would do. However, according to the court in *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), if a proposed modification would change the principle of operation or render it inoperable, then there is no suggestion or motivation to make the proposed modification.

Further, obviousness cannot be established by combining the teachings of the cited references to produce the claimed invention, absent some teaching or suggestion supporting the combination and suggesting the desirability of the combination. Applicants respectfully submit that the Office's statement "that the claimed invention would be obvious to one having ordinary skill in the art" is not sufficient by itself to establish *prima facie* obviousness. According to the Board in *Ex parte Humphreys*, 24 U.S.P.Q.2d 1255, 1262 (B.P.A.I. 1992) the Office was wrong in rejecting the claims for obviousness because the examiner's rejection was not specific as to how one of ordinary skill in the art would have found it obvious to combine the references. Furthermore, they noted the examiner had not explained with any specificity what areas of the references would suggest the combination.

This is the circumstance here. The Office has not identified any objective or specific teachings or suggestion in the cited references that would motivate one skilled in the art to combine the two references. Thus, the Office seems to be merely picking and choosing from the cited references and reinterpreting the prior art in light of applicants' disclosure, in order to reconstruct applicants' claimed invention, but without any instructional or motivating basis in the references themselves. Such approach is improper and legally insufficient to establish any *prima facie* case of obviousness.

In light of the above discussion and the fact that (1) there is no motivation, suggestion or teaching to combine the references; (2) each and every element is not taught or suggested by the proposed combination and (3) even if the references were combinable the primary reference DiMeo will not operate as intended, it is clear that the cited combination fails to establish a *prima facie* case of obviousness of applicants' claims as herein amended.

Conclusion

Applicants have satisfied the requirements for patentability. All pending claims are free of the art and fully comply with the requirements of 35 U.S.C. §112. It therefore is requested that Examiner Saint – Surin reconsider the patentability of all pending claims, in light of the distinguishing remarks herein and withdraw all rejections, thereby placing the application in condition for allowance. Notice of the same is earnestly solicited. In the event that any issues remain, Examiner Saint-Surin is requested to contact the undersigned attorney at (919) 419-9350 to resolve same.

Respectfully submitted,



Marianne Fuierer
Reg. No. 39,983
Attorney for Applicant

INTELLECTUAL PROPERTY/
TECHNOLOGY LAW
P.O. Box 14329
Research Triangle Park, NC 27709
Telephone: (919) 419-9350
Fax: (919) 419-9354
Attorney Ref: 2771-546 CIP1 (7494)